REMARKS

Applicant appreciates the great effort, care and time that the Examiner has expended in reviewing this application and preparing the Office Action.

However, it appears that the objections to the specification and the various rejections of the claims under consideration, namely claims 1-12, are based upon an unfortunate misunderstanding of the present invention. This is not a "cold fusion" invention, thus, the rejections made in the Office Action simply are not applicable to the presently claimed invention. For the Examiner's convenience, each of these objections and rejections is addressed in detail below.

As suggested by the Examiner, Applicant has also amended the claims to clearly point out that the source of particles includes an ionic solution having a pH of less than 1. These amendments are believed to obviate some or all of the rejections and objections under 35 USC 112, first and second paragraphs, as discussed below. This is also believed to clarify the differences between the present invention and the references cited by the Examiner.

The Present Invention

Contrary to the Examiner's assertion, the Applicant's claims under consideration (claims 1-12) are not "directed to the creation and utilization of a stable plasma in a solid **including causing the plasma particle to undergo nuclear fusion.**"

Rather, the present invention is directed to a method and apparatus for the creation and maintenance of a stable very high density plasma inside of a solid that is useful for a number of purposes, including the storage of energy such as the storage of hydrogen in the form of hydrogen isotopes in a high density plasma. The plasma of the present invention is a high density plasma of protons, deuterons or tritons. The creation of the plasma is described in detail in the specification and relies upon the ability of protons, deutrons, and tritons to penetrate inside of a solid upon addition of sufficient energy through the application of an appropriate electrical field. The invention is described in sufficient detail so as to enable one skilled in the art to practice the presently claimed invention.

Should the Examiner so desire, Applicant would be happy to supply a declaration of an expert in the field attesting to the ability to practice the presently claimed invention in view of the instant disclosure.

Non-election of Claims 13-38

Applicant notes that with the filing of the accompanying Request for Continued Examination, cancellation of the non-elected claims is not required at this time. Accordingly, applicant has deferred cancellation until such time that cancellation of the non-elected claims is required.

The Examiner, on page 2 of the Office Action, has disagreed with Applicant's attempt to explain the differences in "experimental conditions" between his invention and that of Williams et al. This appears to be based upon a misunderstanding of the essential differences between the present invention and that of Williams et al. which the applicant will endeavor to rectify by the following explanation.

As noted by the Examiner, the electrolysis cells used by Williams et al. are of the same general kind as those described in this invention. However, the experimental conditions are significantly different in a number of regards, and it is impossible to form the plasma of the present invention inside the lattice of a cathode using the experimental conditions described by Williams et al.

As disclosed and discussed in detail in the present specification and below, there are a number of fundamental conditions necessary for the creation of the plasma of the present invention inside of the lattice of an electrode. The experimental conditions necessary to the formation of plasma inside the lattice of the cathode are simply not met by Williams et al. and are discussed in greater detail below.

One of the fundamental conditions necessary to the formation of sufficient plasma inside the lattice of the cathode is that the solution must have a pH lower than 1, as presently recited in the claims. The most acidic of the solutions disclosed and/or described by Williams et al. is a solution of 0.1 M H_2SO_4 whose pH at 1.2 is greater than 1. Accordingly, this rejection is

believed to be clearly obviated, and reconsideration and withdrawal of the same is respectfully requested.

The Examiner points out that on page 4 of the specification, under the heading "Conditions Required to Create a Plasma of Hydrogen Isotopes Inside a Solid" it is very broadly stated that the electrolyte in the electrolytic bath of Figure 1 is an ionic solution with an acid or basic pH. However, the rest of the specification describes how with a basic solution it is very difficult and requires a great deal of time and energy to increase the concentration of the hydrogen isotope in the lattice, and any plasma that is created is very limited in amount and is transitory in nature. In contrast, for acidic solutions of less than pH 1, the creation of plasma is far easier, takes a fraction of the time, and requires minimal current-density threshold. Furthermore, sufficient plasma is generated so that it can be collected and stored by vibration of the lattice. See for example, page 20, line 36 to page 21, line 26.

This is because the plasma only begins to appear when each elementary cell holds a hydrogen atom. See page 19, lines 14-18. For a basic solution, it would require an immensely long time to have the H^+ concentration increase sufficiently to generate a plasma. In contrast, with an acidic solution, not only can this be achieved in our lifetime, but it can be achieved on the order of minutes to hours.

Another fundamental condition necessary for the formation and retention of the plasma inside the lattice of the cathode, as noted above, is the use of vibrations so as to "cage" or retain the protons in the cavity where they are free to move about, thus creating a plasma in a solid. This simply is not present in Williams et al or in Fleischmann and Pons.

The Examiner has misunderstood the disclosure in the specification and asserted that "[t]he specification on page 9 line 22 refers to the creation of plasma in a solid in prior art experiments wherein the pH ranged from 0.4 – 1.8!" This is simply incorrect. The specification does not refer to "the creation of plasma in a solid" wherein the pH ranged from 0.4 – 1.8. Instead, what the specification refers to are prior experiments in which a palladium cathode demonstrated peculiar behavior when in an acid solution. This is clear when one looks at the specification at page 9, lines 25 et seq. where it states:

> These experiments are summarized a curve 5a and 5b and prevent the potential V of the palladium in function of Log i figure 5a shows curves representing the pH range 0.4 – 1.8. These curves are divided into three regions. The first region, at the lowest current-densities shows a linear relationship between current-density and potential. The middle region shows a linear relationship between V and Log i with Tafel b slopes progressing from 30 mV to 42 mV at pH + 0.84. The third region, at the highest current-densities, also shows a linear relationship between V and Log i, but with a b slope of about 120 mV. The more acid solutions are also divided into three ranges -- the first two sections being essentially the same as the pH 0.84 curve of Figure 5a. However, the third section, at the highest current-densities, flattens out and, in this range, V is virtually independent of current-density.

There are two categories of curves represented in the figure 5a. The curves for the pH: 1.8, 1.58, 1.15 and 0.84 show the class profile for the electrochemical production of hydrogen for low current-densities, the slope progressing from 30 mV to 42 mV. Then for high current-densities, the slope has a value of about 120 mV. The first slope represents the first step of the electrochemical process (production of hydrogen atoms). The second slope corresponds to the second electrochemical step (the production of hydrogen molecule) of the electrochemical process. Only the curve for the experiment where the pH has the value 0.4 displays fundamental difference. The last section of the curve (at the highest current density) flattens out. In this range the potential is virtually independent of the current-density. The explanation of why this slope is nil is given on page 10 of the application. When the pH is 0.4 and for the highest current densities:

> The total current-density consists of two parts: the first part consists of the two first electrochemical steps (with a slope b = 40 mV), the second part ($H^+ + e^- \rightarrow$ plasma) with a slope b = 0 mV.

For high current-densities (greater than 0.1 A/cm^2) the second part becomes greater than the first. This explains why the aggregate slope becomes nil. There is accumulation of plasma inside the cathode. But in the case where the pH is equal to 0.84, the curve shows that the slope b is 120 mV for high current-density. This means that the second electrochemical slope of the mechanism represents the entirety of the current exchange of the cathode. For this pH, the formation of plasma is negligible which results in minimal contribution to the total current-

density. If the formation of plasma was not negligible, the slope of the curve for high current density would reach between 0 and 40 mV. The transition between the preponderance of the formation of plasma and the preponderance of the electrochemical mechanism as shown on the figure 5a occurs between a pH 0.4 and a pH 0.84. Therefore, figure 5a clearly displays the importance of the pH for pH>0.84, formation of plasma in the cathode is negligible. For pH<0.14, formation of plasma becomes predominant at high current densities. This is why the specification at page 21 states:

"for acid solutions where pH <1 the creation of plasma is far easier."

For pH>1, the quantity of protons available in the solution is insufficient for the production of any appreciable amount of plasma. To obtain high current-densities, it becomes necessary to use more negative potentials to attract the protons from the solution. Since the speeds of the electrochemical reactions are exponential functions of the potential, the more negative the potential becomes, the more the protons are used by the electrochemical mechanism to produce molecular hydrogen. Consequently there are far less protons available to form plasma. The more the pH becomes basic, the more the potential must become negative. Therefore, the formation of plasma becomes more and more negligible, or non-existent. Experimental conditions of pH>1 would require not hours but months and even years to accumulate a notable quantity of plasma. These conditions are of no use whatever to create plasma inside the cathode for any commercial use. On the contrary, the basic solutions allow to charge more hydrogen atoms in the palladium (see Kunimatsu).

Objection of the Specification Under 35 USC 112, 1st Paragraph

The specification has been objected to under 35 USC 112, 1st paragraph, as failing to provide an adequate written description and as failing to provide an enabling disclosure and claims 1-12 have been rejected for the same reasons. This objection and rejection are respectfully traversed and are believed to be obviated in view of the following comments.

In determining whether this is adequate written description and enabling disclosure, one must look to the **claimed** invention. Here, claims 1-4 and 7-8 are directed to a method and apparatus for creating and using a stable plasma, claims 5-6 are directed to a method and

apparatus for creating and releasing a stable plasma, claims 9-10 are direct to a method an apparatus for storing energy in the form of a stable plasma, and claims 11-12 are directed to a method and apparatus for storing and using particle under the form of a stable plasma. In all of these claims, as well as the claims removed from consideration, a stable plasma is the focus of the claimed invention.

The presently claimed invention is not directed to "nuclear reactions", "nuclear fusions" or the generation of "excess heat" from nuclear and/or chemical reactions, and thus, the Examiner's objections to the specification, as well as the rejection of the claims under consideration, on these grounds is incomprehensible and totally without merit and should be withdrawn.

As noted on page 4 of the Synopsis of Application of Written Description Guidelines posted on the U.S. Patent Office's website:

> There is a strong presumption that an adequate written description of the claimed invention is present in the application as filed. If the examiner determines that the application does not comply with the written description requirement, the examiner has the initial burden, after a thorough reading and evaluation of the content of the application, of presenting evidence or reasons why a person skilled in the art would not recognize that the written description of the invention **provides support for the claims.** (emphasis supplied).

Applicant further notes that claims 1-12 do not discuss, claim, or even require "the plasma particles to undergo nuclear fusion". Since "causing the plasma particles to undergo nuclear fusion" is not part of the presently claimed invention under examination, there simply is no basis for objecting to the specification as lacking an adequate description or an enabling disclosure for matter that is not in the claims under consideration.

The Examiner has asserted that the "concept of causing particles (e.g. hydrogen isotopes as in the instant case) to enter a solid and undergo nuclear fusion, as become known in the art as 'cold fusion'." And has given a general consensus by those skilled in the art, including citations to a number of articles in the New York Times and the Washington Post, that the "cold fusion" assertions by Fleischmann and Pons were without merit in that their results were due to experimental error and that there has been no evidence in the experiments

of others of the generation of particles to support allegations of nuclear fusion or the allegation of excess heat production.

Credible scientists throughout the world have since reconsidered this assumption that Fleischmann and Pons experiments showing "cold fusion" is without merit and the initial view is now being revised. This new look at "cold fusion" has been undertaken in view of the anomalous phenomenon observed by many credible scientists throughout the world, which has yet to be explained. See for example, the Infinite Energy, Issue 44, "U.S. Navy Report Supports Cold Fusion" citing the report issued by the U.S. Navy, "Thermal and Nuclear Aspects of the Pd/D_2O System, Vol. 1: A Decade of Research at Navy Laboratories & Vol. 2: Simulation of the Electrochemical Cell (Icarus) Calorimetry" by S. Szpak and P.A. Mosier-Boss, eds.

Applicant agrees with the definition of the "cold fusion" concept set forth by Fleischmann and Pons:

> *"This particular concept relies on the incorporation of a quantity of deuterium into a metal lattice, to bring about nuclear fusion reactions of the Deuterium therein."*

In this definition, according to the McGraw Hill dictionary of scientific and technical terms, deuterium means:

> *"Deuterium: the isotope of the **element** hydrogen with one neutron and one proton in the nucleus."*

And the definition of **element** in the same dictionary is:

> *" a substance made of **atoms** with the same atomic number."*

Therefore, the concept defined by Fleischmann and Pons describes the nuclear fusion of deuterium **atoms** or **molecules** into a metal lattice.

In all the references cited within the Office Action of April 19, 2001 (3/24/89 article by D. Braaten, article by Stipp in the Wall Street Journal, article by Browne in the New York Times, Kreysa et al., Lewis et al., Hilts, Horangi, Ohashi et al., Miskelly et al., Chapline et al., page A14 of the 07/13/89 edition of the Washington Post, Cooke Alber et al., Faller et al.,

Haydas et al., Shani et al., Ziegler, Price et al., Schrieder et al., and page A3 edition of the Washington post), the authors describe the concept created by Fleischmann and Pons, and use the word "deuterium" which defines strictly deuterium **atoms** or **molecules**. The pressure of the deuterium **atoms** inside the metal lattice is used to cause the fusion reactions.

Historically, the possibility of producing fusion reactions by compressing cold hydrogen has been of interest to astrophysicists. Such fusion reactions or pyenonuclear reactions are very difficult to obtain. The spontaneous fusion rate of hydrogen molecules where the nuclei are separated by 0.7 Å is 10^{-64} fusion/s. With a mass of deuterium equal to that of the sun, this rate corresponds approximately to one fusion event every year. Clearly not a likely candidate for an energy source.

Inside a hydride of palladium (PdH), the space between the deuterium atoms is of the order of 2 Å, which corresponds to a deuterium pressure of one thousand atmospheres. The space between the nuclei of deuterium is more than twice the spacing inside a molecule of D_2. The pyenonuclear fusion rate is thus correspondingly much smaller than that inside molecular deuterium. Fusion is simply not sustainable inside PdH.

All the references previously cited in the Office Action of April 19, 2001 confirm this impossibility. As correctly noted by the Examiner, the concept invented by Fleischmann and Pons is simply non-functional. All the results achieved to date are negative: no excess heat, no neutrons, no rays, no helium, no tritium, and so on and so on.

As noted above, the concept defined by and claimed in this application has nothing in common with that described by Fleischmann and Pons. The Applicant completely disagrees with the analysis performed by the Examiner equating these two distinct and different concepts and the conclusions reached therefrom.

The Fleischmann and Pons concept relied upon the incorporation of deuterium **atoms** inside the metal lattice to form PdH with a maximum ratio limited to 1. These deuterium **atoms** are fixed within the lattice and, as explained previously, the distance between the deuterium **atoms** of about 2 Å prevents any fusion reactions from being initiated **using the Fleischmann and Pons concept and process.**

Contrary to the Examiner's contention on page 3 of the Office Action, Applicant has **not** asserted that nuclear reactions cannot be obtained in **Applicant's process**, but rather has simply pointed out that **nuclear reactions cannot be obtained using the concept and process of Fleischmann and Pons**.

In contrast, the present invention, described in detail and claimed in this application, is based on the incorporation of protons, deuterons, and tritons inside the lattice. These particles remain free to move inside the lattice. Because they are free to move, these particles can move within very close distance of each other. This allows for the formation of a stable plasma inside the lattice, in particular a very high density plasma, due to the ability of the particles to move within a very close distance of each other. This close distance also has the effect of facilitating fusion reactions under appropriate conditions, which is not the subject matter of the claims at issue here.

The concept invented by Fleischmann and Pons relies on the electrolysis of heavy water to incorporate deuterium atoms (or isotopic hydrogen atoms) within the metal lattice. In any case, it involves atoms. However, Applicant notes that the phenomena observed during the electrolytic process of Fleischmann and Pons is completely dependent on the experimental conditions. With metallic cations in heavy water, the surface of the cathode can be plated with a metallic layer. With organic molecules in heavy water, the surface of the cathode can be covered with graphite, or a reduction of organic molecules can be observed. The experimental conditions used by Fleischmann and Pons, identical to those described in all the articles cited, are designed to incorporate deuterium or isotopic hydrogen **atoms** inside the metal lattice. These experimental conditions are perfect to accomplish **this** function.

Contrary to the Examiner's assertion, Applicant has set forth a written description and disclosure that would be understood by one skilled in the art to show that a plasma of particles is generated in the apparatus of the present invention by utilizing the method of the present invention whereas a plasma does not exist in the Pons et al. and the Williams et al. system, but rather atoms are retained in their apparatus.

A plasma is not inherently formed in the Pons et al. and Williams et al. system due to the speed of reaction of the H^+ particles to form atomic hydrogen and then molecular hydrogen. These particles react as soon as they are produced, and thus there is an insufficiency in the amount needed to form the plasma of the present invention. Furthermore, the particles must be retained in the lattice of the cathode in order for the plasma to be created and maintained. This is achieved in the present invention by the vibration of the solid material.

The present invention described in this application also relies upon the electrolysis of water or heavy water solutions under experimental specific conditions. But these experimental conditions, discussed in more detail below, are designed to incorporate the particles H^+, D^+ and T^+ inside a metallic lattice and to keep them in the form of particles or plasma inside the lattice.

Fleischmann and Pons never considered, and thus never stated, that it was possible or desirable to produce plasma inside the metallic lattice for two reasons:

-First, because their concept relies on the introduction of deuterium or isotopic hydrogen **atoms** inside the metallic lattice.

-Second, because, under their concept, the experimental conditions used during the electrolysis only allow for the incorporation of deuterium or isotopic hydrogen **atoms** inside the lattice, not particles.

In conclusion, there is a **clear and perfect** distinction between the concept of Fleischmann and Pons and the presently claimed invention described in detail within this application:

-The Fleischmann and Pons concept relies exclusively on deuterium or isotopic hydrogen **atoms** . The experimental conditions described are uniquely suited to the incorporation of deuterium or isotopic hydrogen **atoms** inside the metal lattice.

-The present invention described and claimed in this application is directed to the storage and use of a **plasma of particles H^+, D^+, and T^+** inside a metallic lattice, and the experimental conditions uniquely suited to that end.

One skilled in the art upon reading the disclosure of Pons et al. would realize that the Pons et al. system only incorporates atoms in the cathode, unlike the present invention that incorporates protons, deutrons, and tritons to form a stable high-density plasma. As noted by the Examiner, Pons et al. utilizes a description that at first blush appears to be similar to the language used to describe the present invention. However, upon careful reading, one skilled in the art comes to the inevitable conclusion that Pons et al. relies exclusively on deuterium or isotopic hydrogen **atoms** whilst the present invention is directed to the storage and use of a **plasma of particles H^+, D^+, and T^+** inside a metallic lattice.

Pons et al. refer broadly to isotopic hydrogen atoms throughout the description of their invention. In thirty six of the first forty nine pages describing their invention, the words "isotopic hydrogen atoms in the lattice" appear at least one or more times per page. For example: page 6 - "migration of isotopic hydrogen atoms in the metal lattice"; page 7 - "accumulating isotopic hydrogen atoms in the metal lattice"; page 7 - "compression of isotopic hydrogen atoms in the metal lattice"; page 16 - "absorption of isotopic hydrogen atoms in the metal lattice"; and page 19 - "with isotopic hydrogen atoms charging a metal lattice".

In the second full paragraph of the page 20, Pons et al. state that

> such that the ration of ordinary hydrogen nuclei (protons) in the lattice to the total deuterium nuclei (deuterons) and/or tritium nuclei (tritons) is preferably about 5:1 to 1:5

but do not state that the nuclei are free inside the metal lattice.

This sentence used by Pons et al. means that the isotopic hydrogen atoms contain different kinds of nuclei, in some particular ration. By comparison, people can be classified according to the color of their eyes. In any given group, some people have blue eyes, other green eyes and other still brown eyes. But the ratio of the different groups does not mean that the eyes are outside the body of these persons. Pons et al. is simply referring to the quality of the hydrogen atoms (hydrogen, deuterium, tritium) not their ionic counterpart.

The first paragraph page 24 of Pons et al. description absolutely does not state that the nuclei are free from the hydrogen atom in the metal lattice but instead states that:

"The charging of the metal, i.e., electrolytic compression of isotopic hydrogen in the metal lattice is carried out to a final chemical potential of isotopic hydrogen in the metal, due to accumulation/compression of isotopic hydrogen nuclei in the lattice, which is sufficient to produce a desired level of heat generating events within the metal lattice---- generation of nuclear fusion products ----."

This paragraph clearly states that the compression of isotopic hydrogen in the metal lattice carries along the compression of the nuclei of the atoms to produce nuclear fusion.

The second full paragraph on page 25 of Pons et al.'s description states:

> "At potential more negative than +50 mV (reference to a reversible hydrogen electrode) with the PdD lattice is in the beta (β) phase, deuterium is in the form of isotopic-protons and is highly mobile."

First from + 50 mV to 0 mV/RHE - the hydrogen is not under the atomic form. The hydrogen loses its electron. But because of the positive potential of the metal, the protons can not remain inside the lattice and are evicted immediately from the lattice into the alkaline solution.

Second, for potential <0/RHE, by definition of the reference electrode RHE and in this particular experimental conditions of alkaline solutions, the hydrogen is under the form of atm as seen later in the next paragraph.

Third, the sentence states a gross impossibility because it posits that the deuterium has lost its neutron inside the lattice.

The first full paragraph on page 28 of Pons et al. relates the adsorption of deuterium inside palladium: "D lattice atoms exist predominantly as freely mobile nuclei."

The sentence on page 39 of Pons et al. states:"isotopic hydrogen nuclei dissolved in a metal lattice in accordance with the invention are highly compressed and mobile."

The phenomenon described by these two quotations of Pons et al. is false. The hydrogen is mobile inside the lattice but not as free nuclei.

The D lattice of Pons et al. is the result of the entrance of the deuterium inside the lattice. The penetration of isotopic hydrogen inside the metal lattice in numerous cases provokes the formation of metal hydride. These metal hydrides are well known and studied in the literature. In general, depending on the nature of the metal three categories of metal

hydride compounds are created: ionic, metallic and covalent. The classification is based on the predominant character of the metal hydrogen bond and is somewhat equivocal since no one compound exhibits purely one type of bonding. In the case of palladium, the metal hydride is a metallic hydride. This usually created through the direct reaction of the metal with hydrogen gas or electrochemically. Following both methods, atomic hydrogen diffused into the metal lattice where it will occupy either an octahedral or tetrahedral interstitial site inside the lattice. In some cases both types are occupied.

This metallic hydride has a high hydrogen mobility and metallic properties. But hydrogen in the metal is neither a discrete proton or anion. Upon entering the metal lattice there are substantial changes in the electronic bond structure which can be correlated to the stability of the hydride structures and heats of formation. Simply put, electrons are added to empty states near the fermi level while there is simultaneous increase in electron density about the interstitial hydrogen atom. In a sense, the interstitial H atom has both an anionic and protonic character (See A.C. Srvitendick, Z. fur Physikaliske Chemi N. F. Bd. 117, S. 89-112 (1979)).

Inside the lattice, when the concentration in deuterium increases from $PdD_{0.6}$ to $PdD_{0.9}$ the D-D distance actually increases from 2.847 Å to 2.875 Å because of the expansion of the unit cell. See E. Wick and H. Brodowsky in "Topics in Applied Physics - Hydrogen in Metals II", G. Alefeld and H. Vokl ed., pp 72-155, Springer-Verlag, Berlin 1978. See also J. E. Shirber and B. Morosin, Phys. Rev. B12, 117 (1975). More generally, structural models derived from bond structure calculations (see A.C. Srvitendick, Z. fur Physikaliske Chemi N. F. Bd. 117, S. 89-112 (1979)) and geometric considerations (see D. G. Westlake, Journal of the Less Common Metals, 103, 203-209 (1984)). predict that no two equilibrium sites less than 2.1 Å will be occupied simultaneously.

In summary, the hydrogen inside the metal lattice is mobile during its diffusion from the surface into the lattice. The hydrogen then occupies either an octahedral or tetrahedral interstitial site in the lattice, or both. The hydrogen in the metal is neither a discrete proton or an anion.

It is clear that the concept of Pons et al. as stated in their description is designed to accumulate "isotopic hydrogen atoms" inside the lattice and compress them to obtain nuclear

fusion. There is never a plasma of free particle H^+, D^+, T^+ inside the metal lattice as there is in this invention. The two concepts are completely distinct.

From this exposition on "cold fusion" and the lack of evidence to date of fusion and/or excess heat, the Examiner has questioned Applicant's specification as to how the invention would be operative. As noted previously, should the Examiner so desire, Applicant will provide a declaration of an expert showing that the present disclosure is both sufficient and enabling so as to allow one skilled in the art to practice the presently claimed invention.

With regard to the issues raised on page 5, lines 13 to 19, and page 6, lines 1 to 14, Applicant notes that the formation of plasma inside a solid is described in detail in present specification at page 9, line 14 to page 11, line 3. The present inventive concept of the formation of plasma inside palladium is based on and builds upon the experiments performed by Clamroth and Knorr, and successfully repeated by Schuldiner and Hare. These experiments are summarized on Figures 5a and 5b of the application. They present curves that show the potential V of the palladium as a function of the logarithm of the current-density during the production of hydrogen. For the more acidic solutions and the highest current-densities, the curve flattens out. In this range of current-density, the potential is independent of current-density. This means that the slope of the curve is nil.

But in any electrochemical mechanism, the slope is always different from zero. It is impossible to produce hydrogen molecules with a slope (b=0); the electrochemical mechanism is masked by a new phenomenon. This phenomenon is the accumulation of plasma ($H^+ + e^- \rightarrow$ plasma) inside the lattice. The particles remain inside the cathode without reacting. This explains why the slope is nil. For small current-densities, the electrochemical mechanism is the only mechanism occurring. There is no accumulation of plasma. But for the highest current-densities, the reverse is true. The formation of plasma is the prevalent phenomenon occurring which explains why the slope is nil (b=0). These experiments have been performed successfully and documented. They are based neither on assumption nor on speculation. Rather, they are based on real-life experiments that have been successfully and reproducibly performed.

Accordingly, Applicant has clearly presented reputable factual evidence supporting his description in the present application of the formation of a plasma in a solid, the ability to manipulate the plasma, and the utilization of the plasma in the manners set forth in the

specification. Applicant notes that the presently claimed invention does not call for "causing the plasma to undergo a nuclear fusion or excess enthalpy reaction" and thus there is no need or reason for providing such a detailed disclosure in the specification, particularly since it is not relevant to the present invention.

Other experiments also prove the presence of plasma inside the cathode. For example, the application of a large cathodic current-density to a palladium cathode in an acidic solution (pH<0) for several hours allow the formation of PdH and the accumulation of plasma. When the current is interrupted, the palladium still contains both PdH and plasma. Measuring the potential of the palladium cathode and comparing it to that of a platinum electrode acting as reference after the current is interrupted shows two phases:

-First phase: The potential remains positive during several hours. Slowly the hydrogen atoms disappear from inside the metal. The potential decreases.

-Second phase: The potential becomes negative because of the presence of the particles H^+, D^+ and T^+ inside the metal. When there is no plasma the potential remains positive.

The presence of plasma is explained in detail on page 11, lines 3 to 37 of the present specification. Again, these experiments have been performed successfully and documented. They are based neither on assumption nor on speculation. Rather, they are based on real-life experiments that have been successfully and reproducibly performed.

Accordingly, Applicant has clearly presented reputable factual evidence supporting his description in the present application of what is occurring in the cathode, as well as to what happens to the hydrogen when and after it has been caused to enter the cathode, the amounts of hydrogen that can be caused to build up in the cathode, as well as to the existence of hydrogen as isotopes rather than as molecules or atoms or in the form of a hydride. From an analysis of the Pons et al. and Williams et al. systems, it is clear that atomic hydrogen is present, rather than the plasma of the present invention.

Applicant notes with appreciation the Examiner's explanation on page 6 of the Office Action of April 19, 2001 as to the unpatentability of mere theories or concepts. As noted in the

MPEP §706.03(a), "[a] scientific principle, divorced from any tangible structure, can be rejected as not within the statutory classes. *O'Reilly v. Morse*, 56 U.S. (15 How.) 62 (1854)."

However, that simply is not the case here. The presently claimed invention is not directed to mere theories or concepts divorced from any tangible structure or process step, but rather the claims are directed to a method and an apparatus for creating and using or releasing a stable plasma or storing energy or particles in the form of a stable plasma that is clearly described in the specification in sufficient detail and clarity to as to enable one skilled in the art to practice the present invention. Thus, the Examiner's assertion that the presently claimed invention is mere a theory or concept is without merit and withdrawal of the same is respectfully requested.

From all of this recitation in the Office Action as to what "cold fusion" is and why "cold fusion" does not work, the Examiner has somehow arrived at the conclusion that Applicant's invention is also directed to "cold fusion" and thus also cannot work. This is simply incorrect for two reasons. First, as noted above, "cold fusion" may work, just the reproducibility of the initial Fleischmann and Pons experiment is in question - not the science of the matter. Second, the present specification is sufficiently detailed so as to permit one skilled in the art to practice the presently claimed invention.

The Examiner has summarized this in stating that the "disclosure is thus insufficient and non-enabling as to exactly what is all is necessary to actually present a reproducible, sustainable nuclear fusion or excess enthalpy reaction, and as to what would cause such reactions to actually take place in applicants system as illustrated in any of applicants figures." The Examiner repeated asserts that there is no evidence to support that nuclear fusion and/or energy producing reactions will take place in Applicant's invention, particularly not to the extent to support the uses set forth in the specification.

To all of this, Applicant must again point out that the presently claimed invention is not directed to "cold fusion". No mention or reference is made in the claims under consideration as to nuclear fusion. Furthermore, no mention or reference is made in the claims as to "excess enthalpy reaction".

The present invention is directed to a method and apparatus for creating and using or releasing a stable plasma or for storing energy or particles in the form of a stable plasma. This is not nuclear fusion. This is not generation of "excess enthalpy reaction." This is not cold fusion.

Applicant respectfully requests reconsideration of the Examiner's assertion that the present process is a "cold fusion" process. It simply is not the case. Applicant further requests that all of the rejections based on this assertion also be reconsidered and withdrawn.

The Examiner, on page 7, lines 7-14 of the Office Action of April 19, 2001, asserts that the disclosure is insufficient for failing to set forth what the "required pulses" would be when using a pulsed system, including what would represent a suitable pulse width and pulse rate. Although the Examiner acknowledges the description in the specification of the creation of the required pulses by adding periodical impulses to a constant current density to force the period entry of similar protonic wave. However, the Examiner has asserted that there are insufficient examples in the specification.

In response thereto, Applicant notes that one skilled in the art, upon reading the present application, would clearly realize that it is possible to obtain pulsed protonic waves by using an alternative current density and adding to a constant current-density. The frequencies of the alternative and constant current densities depend on the size, shape and nature of the cathode.

For example, for a temperature of 25 °C, a cube of palladium with a side of 5 cm, with a module of Young 121 x 10^9 N/m^2, a density of 12 x 10^3 Kg/m^3 and node of vibration located at the center of the cube, the cube will vibrate at its first resonance frequency at about 29250 Hz. The experimental conditions necessary to accumulate plasma can be for example:

$I_{constant}$ = 30 A or in current density, 0.2 A/cm^2 >0.1 A/cm^2

I_{Altern} =15 A or in current density, 0.1 A/cm^2

Frequency of I_{Alter} = 29250 Hz

These protonic waves generate ultrasonic vibrations inside the cube. They also appear in the solution where they can be measured with an ultrasonic detector.

Accordingly, application has shown that the present disclosure is sufficient to one skilled in the art to determine what the "required pulses" would be when using a pulsed system, including what would represent a suitable pulse width and pulse rate. Furthermore, Applicant notes that providing a specific number of examples in the specification is not required in U.S. Patent Law. Rather, all that is required is that the disclosure be sufficient to allow one skilled in the art to practice the claimed invention. That standard is clearly met here.

Furthermore, the Examiner has asserted at page 7, lines 15 to 17 that the disclosure is insufficient as to the basis for the statement that the plasma will be formed in the metal matrix and that this plasma will have a very high density and at page 8, line 11 to page 9, line 3 that the disclosure is insufficient and non-enabling as to how the desired particle concentration is achieved, the parameters of the operating system to achieve this, the determination of the concentration, and why the plasma is stable is stable and can be maintained.

In response thereto, Applicant notes that such densities of particles (10^{23} to 10^{24} particles/cm^3) may seem very surprising. But in fact these concentrations are very easy to obtain using the procedures of the present invention as set forth in the specification, and would be recognized by one skilled in the art upon reading the specification.. The plasma cells which contain one hydrogen atom fixed inside have a free space of about 2 Å^3. Thanks to the nuclei of the metal, the particles H D T$^+$ inside these cells can only move within the available space. Inside this 2 Å^3, a single proton represents a density of 5 10^{23} protons/cm^3. When the palladium is saturated with hydrogen, the metal can reach a levels of $PdH_{0.8 \text{ to } 0.9}$. This means that the plasma reaches densities of $5x10^{23}$ protons/cm^3 in 80 to 90% of the available space inside the cathode. With more than one proton per plasma cell, the densities are larger still.

By comparison, plasma gases created by classical means under magnetic confinement only reach densities of about 10^{14} particles/cm^3. In solutions whose pH is slightly superior to pH=0, the concentration of protons inside the solution is of the order of 10^{21} protons/cm^3. The greater the density of the containment medium, the greater the densities the plasma will reach. The plasma inside the solid can only be maintained because the vibrations induced inside the solid prevent the recombination of the H D T$^+$ particles and the electrons.

Again, Applicant has shown that to one skilled in the art the present disclosure is more than sufficient to show that the plasma will be formed in the metal matrix and that this plasma will have a very high density. One skilled in the art upon reading the present application would also be able to determine how the desired particle concentration is achieved, the parameters of the operating system to achieve this, the determine the concentration, as well as why the plasma is stable is stable and can be maintained.

With regard to the Examiner's questions at page 7, line 18 to page 8, line 10, Applicant confirms that the electrochemical cells illustrated in documents such as William et al, and Pons et al do not form a plasma inside the Pd cathode. The disclosure in the application (see specifically page 9, line 14 through page 10 and page 14, line 34 through page 16) clearly explains why this is so.

During the cathodic production of hydrogen, the total current-density is made up of two parts (see page 10 line 31 to 34). The first part corresponds to the electrochemical mechanism of molecular hydrogen production. The second part represents the accumulation of plasma inside the solid. The relative importance of these two parts depends on several parameters. Two of these parameters are pH of the solution and vibrations of the cathode.

When the pH of the solution is smaller than 1, the concentration of protons available inside the solution is superior to the quantity necessary for the electrochemical mechanism of hydrogen. The excess protons can enter inside the solid to be stored as plasma. But if the pH is larger than 1, the quantity of protons available will only allow the presence of the electrochemical mechanism. There is no free excess of free protons to be stored as plasma.

When the pH is smaller than 1, causing the solid to vibrate is necessary to extend the penetration of the plasma further inside the cathode (as described in part D of the application, on pages 14 and 15). These vibrations prevent the recombination of the H D T^+ particles with the electrons.

Pons et al and Williams et al. do not follow any of these experimental conditions, and therefore simply cannot create plasma inside the palladium cathode.

Thus, one skilled in the art would find the present application to contain sufficient disclosure as to the features and parameters present in the claimed invention that enable Applicant to produce plasma where Pons et al. and William et al. cannot achieve this feat.

The Examiner has also asserted, at page 9 line 4 to 13 of the Office Action of April 19, 2001, that the disclosure is insufficient as to how and in what manner, the energy produced in forming molecular hydrogen will place the metallic atoms in a state of vibration, will disperse the H D T^+ inside the layer, disperse the atomic hydrogen in the layer and the metal, and push the molecular hydrogen outside the electrode after the reaction.

In reviewing the present application, one skilled in the art would realize that the electrochemical mechanism appearing in a layer inside the cathode produces simultaneously the molecular hydrogen and an energy of 31.3 eV for each molecule of H_2. **Locally** this energy is huge. With a current-density of 0.1 A/cm^2, a surface energy of 3 $Watts/cm^2$ appears inside the layer. Part of this energy is transferred to the atomic or molecular hydrogen under the form of kinetic energy. This kinetic energy helps disperse the atomic hydrogen in every direction, including toward the inside of the metal cathode, and pushes the molecular hydrogen outside the electrode. The remainder of the energy, coupled with the movements of the H and H_2 inside the layer, cause the metallic atoms to vibrate chaotically.

Accordingly, one skilled in the art upon reading the present application would be able to readily determine how and in what manner, the energy produced in forming molecular hydrogen will place the metallic atoms in a state of vibration, will disperse the H D T^+ inside the layer, will disperse the atomic hydrogen in the layer and the metal, and push the molecular hydrogen outside the electrode after the reaction.

In response to the Examiner's question on page 9, lines 12 to 13 of the Office Action of April 19, 2001, Applicant replies that one skilled in the art would know that the volumic mass P is the density of the metal or the mass per unit of volume.

In response to the Examiner's question and assertion of insufficiency of disclosure at page 9, lines 14 to 16 of the Office Action of April 19, 2001, Applicant notes that the parameters V_a and V_{free} are proportional to each other. As one skilled in the art would know and appreciate,

the coefficient of proportionality depends on the crystallographic structure of the solid. V_a and V_{free} are not equivalent in physical terms. However, for the purpose of discussing and studying the influence of the interstitial volume inside the lattice, the two parameters V_a and V_{free} can be used interchangeably since they are proportional. V_a is easy to determine, even in the case of an alloy. This explains why use of this parameter is preferred for the discussion.

In response to the Examiner's questions and assertions of insufficiency of disclosure set forth in the Office Action of April 19, 2001 at page 9, line 17 through page 10, line 12, Applicant notes that one skilled in the art, upon reading the present application, would appreciate and understand that inducing vibrations inside the cathode is necessary to extend the presence of the plasma from the outer layer to the interior of the metal cathode. When H D T^+ particle enters inside any metal, it interacts with numerous electrons because of its electric charge. It dissipates its kinetic energy quickly before reacting with an electron to produce atomic hydrogen.

When the cathode is placed in an acidic solution (pH<1), the number of protons entering the layer directly under the surface is greater than the number of protons necessary for the electrochemical mechanism of hydrogen. The energy created as a result of the production of H_2 induce chaotic vibrations of the atoms of the layer. These vibrations communicate enough kinetic energy to the excess H D T^+ particles that they remain under the form of plasma inside the layer.

Outside the layer, the vibrations are rapidly dampened. A H D T^+ particle moving further inside the cathode away from the source of the vibrations, rapidly loses its kinetic energy and reacts with an electron to become atomic hydrogen. To force the H D T^+ particles to remain under the form of plasma inside the core of the metal electrode, their kinetic energy must be maintained. Because of the considerable presence of free electrons, this kinetic energy must be renewed constantly. Operating the cathode at its resonance frequency to extend the vibrations throughout the electrode is the best method to transfer kinetic energy to the H D T^+ particles on a continuous basis. Using the resonance frequency allows the transfer of vastly greater amounts of kinetic energy than that transferred through chaotic vibrations. It thus becomes possible to

force the excess H D T^+ particles present inside the layer deeper inside the metal, and maintain them under the form of a plasma.

Thus, one skilled in the art would understand and appreciate how the plasma is created and maintained in the electrode, and how the vibrations operate to prevent the formation of molecular hydrogen, thus retaining the particle in the metal lattice in plasma form.

Likewise, one skilled in the art, upon reading the present application would find the disclosure to be quite sufficient and would comprehend that the plasma inside the metal is located inside the plasma cells ($2Å^3$). Because of the small size of the cells, the charged particles H D T^+ adopt a very specific structure once there is more than once particle per cell. One skilled in the art would understand that these structures can take the forms described in the specification and on pages 10 and 11 of the Office Action of April 19, 2001. Applicant notes that there are no claims about the structure adopted by the plasma particles in claims 1-12, and thus the objection to the specification and the rejection of the claims based on these structures is without merit.

In answer to the Examiner's questions on page 11, lines 10 to 16 of the Office Action of April 19, 2001, Applicant notes that one skilled in the art would appreciate and understand what is meant by the requirement that the electrolyte solution and the anode must be very pure. In the case of the anode, platinum with a purity of 99.9% is sufficient. The electrolyte can be prepared with pure distilled water and commercial sulfuric acid 95-98% including less than 25 ppm impurity.

Williams et al. and Albagli et al. show that different kinds of impurities can deposit at the surface of palladium such as: C, O, F. SI, As, Na, Zn, Mg and the like. Platinum coming from the anode also deposits on the palladium. These impurities are inconvenient. But if the thickness of this layer of impurities remains small (in the hundreds of Å), the H D T^+ coming from the solution can still penetrate inside the 5000 Å thick layer under the surface in the metal lattice to form plasma in this invention.

In the case of Flanagan, the presence of impurities at the surface of the palladium is much more inconvenient. Flanagan et al. study the absorption of hydrogen dissolved in a

sulfuric acids solution. The surface of the electrode is the location of the transformation of the dissolved molecular hydrogen into atomic hydrogen. The atomic hydrogen created then penetrates into the metal. For this mechanism, the condition of the surface is critical. But in the case of the present invention, since the HDT+ of the solution penetrates inside the 5000 Å thick layer beneath the surface of the electrode the same problems do not occur.

The Examiner has also questioned, at page 11, line 17 through page 12, line 11 of the Office Action of April 19, 2001, the sufficiency of the disclosure with regard to how and in what manner one determines that "stationary waves" are created and maintained inside the cathode , and how the embodiments of Figs 8-12b and 14 can be made operative and with what system parameters, as well as the parameters of the specific operative embodiment of the invention.

Again, one skilled in the art upon reading and comprehending the present invention would understand or be able to readily determine the parameters for the resonance of vibrations. In fact, they would understand that these parameters have been previously presented; including alternative shape of the pulse, frequency, current-density of the pulsed current, as well as one example of shape and size of the cathode, and the position of the node of vibration in the cathode.

Furthermore, one skilled in the art would appreciate that the constant current-density has to be superior to 0.1 A/cm^2 and the $pH < 1$.

The system presented by Williams et al (pH>1, and no vibrations) has been discussed previously. One skilled in the art would appreciate and understand that the Williams et al. system is perfect for the storage of **atomic hydrogen**, but will not store **any** plasma under the experimental conditions presented.

Applicants take great exception to and disagree most strongly with the Examiner's assertion starting at page 12 line 12 that "[i]t is apparent from the specification that applicants concept or theory involving a nuclear fusion system which is actually based on the "cold fusion" systems that came about from the work of F and P, is workable or operative, *only if* these

systems are already operative." (emphasis in original). This is simply not the case with Applicant's invention.

As discussed in great detail previously, and as one skilled in the art would readily appreciate, the concepts presented by Fleischmann and Pons are distinctly different from and operate in a totally different manner from the presently claimed invention disclosed in this application. This has been discussed before. The concept presented by F and P relies on **the incorporation of a quantity of deuterium atoms** into a metal lattice to **bring about nuclear fusion reactions of the deuterium atoms** therein.

The concept presented in this application is based on the incorporation of protons H^+, deuterons D^+ or Tritons T^+ inside the lattice to form a plasma of particles as set forth in claims 1 to 12.

The particles stored inside the electrode are different for both concept: **deuterium atoms for Fleischmann and Pons, particles H^+, D^+ and T^+ for this application.**

The purpose of the storage in the two concepts is as follows:

- nuclear fusion reactions of the deuterium atoms for F and P.

-storage and use of plasma in this application (claim 1 to 12)

In both concepts, the storage is achieved through electrolytical means. The result of the electrolysis depend on the experimental conditions:

- with metallic cations in the electrolytic solution, the result is the plating of the cathode with a layer of metal.

- with organic molecules inside the solution, the result can be:

- a deposition of graphite.

- the reduction of organic molecules into other organic molecules.

- Under the experimental conditions presented by Fleischmann and Pons, deuterium atoms are stored inside the lattice.

- Under the experimental conditions presented in this application, a plasma of H^+, D^+ and T^+ particles is stored inside the lattice.

The five different electrolysis, under five sets of experimental conditions, produce five different sets of results and illustrates five different concepts.

In making this objection to the specification and the rejection of the claims under consideration, the Examiner used the terms "nuclear fusion" five times, "cold fusion" three times, "excess heat" four times, "nuclear fusion system" twice, and "nuclear fusion field" once. **However, the present claims under consideration -- claims 1 to 12 -- are not directed to and make no claim of any kind for nuclear fusion, cold fusion, or production of excess heat.** All the claims describe and claim something distinctly different -- the storage and use of a plasma of particles inside a lattice.

Rejection of Claims 1-12 Under 35 USC 112, 1st Paragraph

Claims 1-12 have been rejected under 35 USC 112, 1st paragraph, as failing to provide an adequate written description and as failing to provide an enabling disclosure for the reasons given in objecting to the specification. This rejection is respectfully traversed for the reasons given above and withdrawal of the same is respectfully requested.

Applicant furthermore takes strong issue with the Examiner's objection to the specification as noted above. The Examiner first describes the concept of Fleischmann and Pons, then proves that this concept is inoperative (no nuclear fusion, no excess heat or neutrons, and the like). However, this is simply irrelevant to the presently claimed invention which is not related to or encompassed by the concepts of Fleischmann and Pons, or "cold fusion" for that matter. The Examiner has incorrectly tried to assimilate the concept presented by Fleischmann and Pons to the concept presented in this application. As a result of this incorrect assimilation, the examiner draws an equally incorrect conclusion: since the Fleischmann and Pons concept is inoperative, then the concept presented in this application must also be inoperative. This is fallacious reasoning.

Applicant has shown repeatedly that the two concepts are completely different (see the previous 14 pages of discussion). Furthermore, the Examiner's objections to the specification in and rejection of the present claims are based on a mistaken belief that the claims require the hallmarks of "cold fusion", namely, nuclear fusion, excess heat, production of neutrons. This simply does not comport with the presently claimed invention. Claims 1-12 make NO mention of nuclear fusion.

Applicant notes that the claims now recite the limitation of an ionic solution having a pH of less than 1. Thus, the claims as presently amended are clearly enabled by the disclosure of the present invention.

Accordingly, there is no basis in fact or law for this rejection and reconsideration and withdrawal of the same is requested.

Rejection of Claims 1-12 Under 35 USC 101

Claims 1-12 have been rejected under 35 USC 101, as being inoperative and therefore lacking utility. This rejection is respectfully traversed for the reasons given above and withdrawal of the same is respectfully requested.

As noted above, Applicant has described in sufficient detail in the present specification so as to allow one skilled in the art to produce a plasma in the lattice of a cathode by following the instant disclosure. Furthermore, Applicant has provided sufficient information so as to enable one skilled in the art to recognize when such plasma has been created.

Accordingly, reconsideration and withdrawal of this rejection is urged.

Rejection of Claims 1-12 Under 35 USC 112, 2nd Paragraph

Claims 1-12 have been rejected under 35 USC 112, 2nd paragraph, as being vague, indefinite and incomplete for the reasons given in the prior response, namely the assertion that "[t]he specification on page 9 states that in an electrochemical cell utilizing a Pd cathode, the **hydrogen isotopes** will be caused to enter the Pd and form a 'plasma' therein". This

rejection is respectfully traversed for the reasons given above and below and withdrawal of the same is respectfully requested.

One skilled in the art upon reading and understanding the present application would consider the claimed invention to be clear, definite and complete. This rejection simply shows that once again the Examiner is confusing the concept presented by Fleischmann and Pons with the presently claimed invention set forth in the present application.

The concept presented by Fleischmann and Pons relies on the **incorporation of a quantity deuterium atoms** inside a metal lattice. In this application, the H D T^+ particles enter the lattice, and part of them remain under the form of plasma inside the cathode. Applicant uses **particles** not atoms and not isotopes of these atoms.

Furthermore, as discussed in detail above, contrary to the Examiner's assertion that Pons et al. shows particles, Pons et al. is merely referring to the quality of the hydrogen atoms (hydrogen, deuterium, tritium) not their ionic counterpart or particles.

The differences between the disclosure of documents such as Williams et al, and Fleischmann and Pons, and this application have been previously discussed in detail and are understood by those skilled in the art.

Additionally, Applicant notes that the claims have been amended to clearly set forth each of the critical features of the present invention.

Accordingly, reconsideration and withdrawal of this rejection is respectfully urged.

Rejection of Claims 1-12 Under 35 USC 102(b)

Claims 1-12 have been rejected under 35 USC 102 (b) as being anticipated by any of Williams et al., Pons et al., Ormorit, Kubota or Makoto. This rejection is respectfully traversed for the reasons given above and below and withdrawal of the same is respectfully requested.

The references simply do no illustrate the same structure and method of operation as disclosed in the present invention. In fact, none of the cited references disclose each and every element of the presently claimed invention and thus none of the cited references can or do anticipate, or even suggest, the present invention.

As explained several times before in Applicant's specification, prior response, and in extensive detail above, Williams et al. and Pons et al. can not produce a plasma of particles H D T^+ under the experimental conditions they chose. They only achieve the storage of deuterium **atoms** inside the lattice of the palladium electrode. Further, there is no reference to vibrations of the cathode so that even if a particle were to reach the interior of the electrode, it would simply, and very quickly, react to form atomic and then molecular hydrogen before a sufficient quantity of other particles could be assembled to form a plasma. Furthermore, as discussed above in detail, Pons et al. does not disclose the storage of particles within the lattice of the electrode. Thus, this reference simply does not disclose or even suggest the presently claimed invention directed to a method and apparatus for the creation, maintenance, storage and use of a plasma of hydrogen particles inside a lattice in a solid material.

Ormorit presents a system which creates electrical discharges into a liquid containing heavy water, or into a mixture of water and a small amount of electrolyte, using high impulse voltages. Deuterium ions are formed from the heavy water and are then **adsorbed** (line 9 page 7) **on the surface** of the electrodes. At the same time, these deuterium nuclei are accelerated towards the cathode by the high voltage. This results in **high efficiency collisions on the surface of supporting electrode**(line 18 to 21 page 11) and provoke the D-D nuclear fusion reaction. The Examiner has asserted that Ormorit is not limited to surface adsorption, but also talks about the absorption of hydrogen. Again, this is a surface phenomenon. This apparatus, designed to produce nuclear fusion reactions, relies on creating the fusion reactions at the surface of the electrode. The experimental conditions (specifically, the solutions chosen and the absence of vibrations) do not allow the creation and storage of plasma inside the electrode. Thus, this reference simply does not disclose or even suggest the presently claimed invention directed to a method and apparatus for the creation, maintenance, storage and use of a plasma of hydrogen particles inside a lattice in a solid material.

The apparatus presented by Kubota is based on the Fleischmann and Pons concept. The electrolysis of heavy water produces heavy hydrogen which is absorbed through the surface of the electrode. The concentration and compression of the heavy hydrogen in the

center of the spherical cathode reaches high levels. But the electrolysis of heavy water (pH>1) does not allow the creation of plasma inside the cathode. Further, there is no reference to vibrations of the cathode so that even if a particle were to reach the interior of the electrode, it would simply, and very quickly, react to form atomic and then molecular hydrogen before a sufficient quantity of the particles could be assembled to form a plasma. Thus, this reference simply does not disclose or even suggest the presently claimed invention directed to a method and apparatus for the creation, maintenance, storage and use of a plasma of hydrogen particles inside a lattice in a solid material.

Makoto presents a fusion heat generating device using the same concept as Fleischmann and Pons. The electrolysis between anode and cathode of heavy water (pH>1) generates heavy hydrogen, which is absorbed by the cathode. Like in the case of Fleischmann and Pons, this system allows the storage of large quantities of hydrogen **atoms** inside the cathode, but does not allow in any way the creation or storage of plasma inside the same cathode. Further, there is no reference to vibrations of the cathode so that even if a particle were to reach the interior of the electrode, it would simply, and very quickly, react to form atomic and then molecular hydrogen before a sufficient quantity of the particles could be assembled to form a plasma. Thus, this reference simply does not disclose or even suggest the presently claimed invention directed to a method and apparatus for the creation, maintenance, storage and use of a plasma of hydrogen particles inside a lattice in a solid material.

Accordingly reconsideration and withdrawal of this rejection is respectfully urged.

Rejection of Claims 1-12 Under 35 USC 102(b)

Claims 1-12 have been rejected under 35 USC 102 (b) as being anticipated by any of Bellanger et al., Schulten et al., Buechler, Lovelock (I) or Pavelle et al. This rejection is respectfully traversed for the reasons given above, below, and in the previous response. Accordingly, withdrawal of the same is respectfully requested.

Again, none of the cited references disclose each and every element of the presently claimed invention, and thus none of the cited references can anticipate the present invention.

Bellanger present a system to separate tritium contained in solution through an electrolytic process. He uses a solution of tritiated water in 20 N soda. The experimental conditions only allow the creation of tritium **atoms** inside the palladium electrode. It is not possible to create a **plasma of particles** inside the electrode using these conditions. Thus, this reference simply does not disclose or even suggest the presently claimed invention directed to a method and apparatus for the creation, maintenance, storage and use of a plasma of hydrogen particles inside a lattice in a solid material.

Schulten presents an electrolytic system which allows the recuperation of hydrogen. A metallic membrane and a liquid alkaline metal taken together constitute the cathode. The membrane is made of palladium or zirconium, or a titanium alloy, or a tantalum alloy, or a niobium alloy, plated on iron. This membrane is very thin (microns thick). All the hydrogen isotopes created inside the membrane diffuse immediately into the molten alkali metal. It is impossible to store any plasma of hydrogen particles inside this membrane. The particles entering through one side of the membrane exit immediately on the other side. Thus, this reference simply does not disclose or even suggest the presently claimed invention directed to a method and apparatus for the creation, maintenance, storage and use of a plasma of hydrogen particles inside a lattice in a solid material.

The electrolytic process presented by Buechler uses 15 to 45 percent potassium hydroxide as electrolyte. Again, this is an electrochemical reaction. Using this experimental condition, it is impossible to create plasma inside the cathode. Thus, this reference simply does not disclose or even suggest the presently claimed invention directed to a method and apparatus for the creation, maintenance, storage and use of a plasma of hydrogen particles inside a lattice in a solid material.

Lovelock (I) presents a combined electrolytic hydrogen gas separator with a palladium or palladium alloy as cathode. The electrolyte was 10% lithium hydroxide, 90% potassium hydroxide (25% water) mixture. Using this condition, it is impossible to store plasma inside the metal. But there are plenty of hydrogen **atoms** present which form hydride with the palladium. As the author notes, the palladium suffers mechanical distortion because of this process. Again, this reference simply does not disclose or even suggest the presently

claimed invention directed to a method and apparatus for the creation, maintenance, storage and use of a plasma of hydrogen particles inside a lattice in a solid material.

Pavelle et al disclose a method and apparatus for increasing the catalytic efficiency of electrodes composed of catalytic material or catalyst. Scientifically, the word catalyst is defined as:

"catalyst: substance that alters the velocity of a **chemical reaction** and may be recovered essentially unaltered in form and amount at the end of the reaction." (definition reproduced from the McGraw Hill Dictionary of Scientific and Technical terms, fifth edition, 1994, p. 324).

The method and apparatus described in the Pavelle et al. patent are meant to increase the **efficiency of the catalytic electrode.** Both the rate of chemical reaction ($2\ (D^+ + e^-) \rightarrow D_2$) and the production of Deuterium gas increase.

Although Pavelle et al. do refer to "absorption of gas or plasma by a latticed structure" (column 3 line 5), they never explain the nature of the plasma, the provenance of this plasma, the method and means by which this plasma enters the lattice, or the experimental conditions under which the plasma is allowed to enter into the lattice. Above all, Pavelle et al. do not disclose what happens to this plasma once it enters the lattice, or even if it remains under the form of plasma after absorption inside the lattice. After the plasma has penetrated the electrode, the **chemical reaction** produces deuterium atoms and molecules.

The solutions used by Pavelle et al. in their "Cold Fusion Application" (lithium or other metal salts doping in heavy water, column 1 line 65) are identical to the solutions used by Fleischmann and Pons and will simply not allow the formation of plasma inside the electrode, as discussed in detail above.

Pavelle et al. disclose the use of different mechanical means to produce resonance inside the Pd Lattice. But as noted previously above, and in the claims, these resonances are used strictly to increase the efficiency of the **chemical reactions of production of Deuterium atoms and molecules in the catalytic materials,** not for any other stated goals.

This is clear when the disclosure of Pavelle et al. is carefully reviewed. For example, Pavelle et al. state at section 2, line 6:

> The aim of these methods is break up of large crystallites of the catalytic lattice into much smaller domains. Keeping the crystallites small appears to enhance the catalytic process.

The stated purpose of Pavelle et al. is to break the crystal structure of the catalytic electrode. See for example, section 3 lines 12 to 17 - "to cause a rupture in the otherwise regular crystal structure of the catalytic electrode"; section 3, line 54 - "breaking local bond"; section 5, lines 27 to 29 - "disturb any higher order alignments which may interfere with the catalytic process"; section 5, lines 36 to 37 - "that will break the large scale domains into smaller scale regions"; section 6, line 29 - "to break up the higher order alignments"; and in section 6, lines 67-68 and section 7, lines 1 and 2, they describe the use of radiations:

> Typical dose rates of 1 megarad- 100 megarads can disrupt the local crystal structure and lead to embrittlement and fatigue like symptoms of the catalytic electrode.

In summary, Pavelle et al. aim to improve the catalytic effect of an electrode to enhance a chemical reaction. The concept of this improvement is the break up of the large crystallites of the catalytic lattice through different means. These break ups can lead to the destruction of the catalytic electrode through embrittlement and fatigue like symptoms.

In direct contrast to Pavelle et al., which is directed to enhancing the catalytic process of a chemical reaction (production of hydrogen at a cathode), the present invention uses vibrations to keep the H^+,D^+,T^+ under the form of plasma inside the metal lattice. Furthermore, unlike Pavelle et al. which seeks to destruct the crystal structure of the catalytic electrode, the present invention requires that the material of the cathode keep its crystal structure and its mechanical properties.

Clearly these two inventions are completely different and distinct.

Accordingly, reconsideration and withdrawal of this rejection is earnestly solicited.

Provisional Rejection of Claims 1-12 Under 35 USC 101)

Claims 1-12 have been provisionally rejected under 35 USC 101 as claiming the same invention as that of claims 1-4 of co-pending Application No. 09/222,311. Applicant will address this issue when provisional nature of this rejection is withdrawn and the claims of the co-pending application are indicated as being allowable.

CONCLUSION

In view of the foregoing remarks, the present application is now believed to be in condition for allowance. The Examiner is asked to consider this response and pass the application to allowance.

Further and favorable consideration is requested.

It is not believed that extensions of time or fees are required, beyond those, which may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required therefore (including fees for net addition of claims or the additional of independent claims in excess of three) is hereby authorized to be charged to Deposit Account No. 50-0548 and the undersigned is requested to be notified of any such charges.

Should the Examiner have any questions, he is requested to contact the undersigned.

Respectfully submitted,

Date: August 25, 2003

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